



# TPACK Essentials: Enhancing Teaching with Technology

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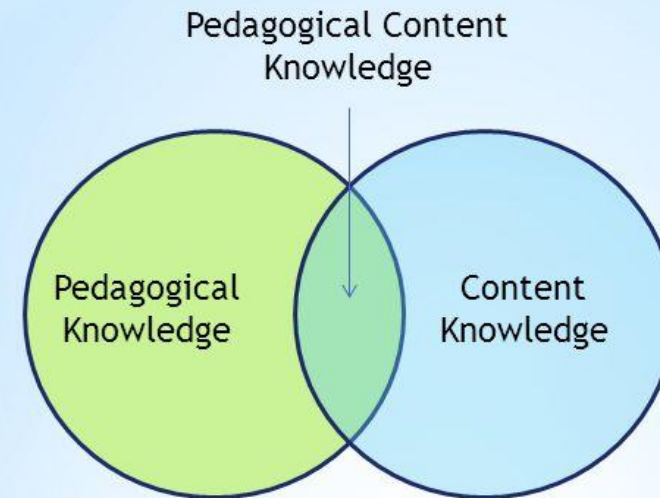


# Pedagogical Content Knowledge

## PCK

(Shulman, 1986, 1987)

A unique body of knowledge that teachers use to transform content to teachable forms taking into consideration learners' difficulties or misconceptions



Content Knowledge:  
Teachers know and understand the subjects they teach, as well as theories, procedures, and frameworks

Pedagogical Knowledge:  
Teachers know the techniques and methods for instruction, including classroom management, lesson planning, and student evaluation.

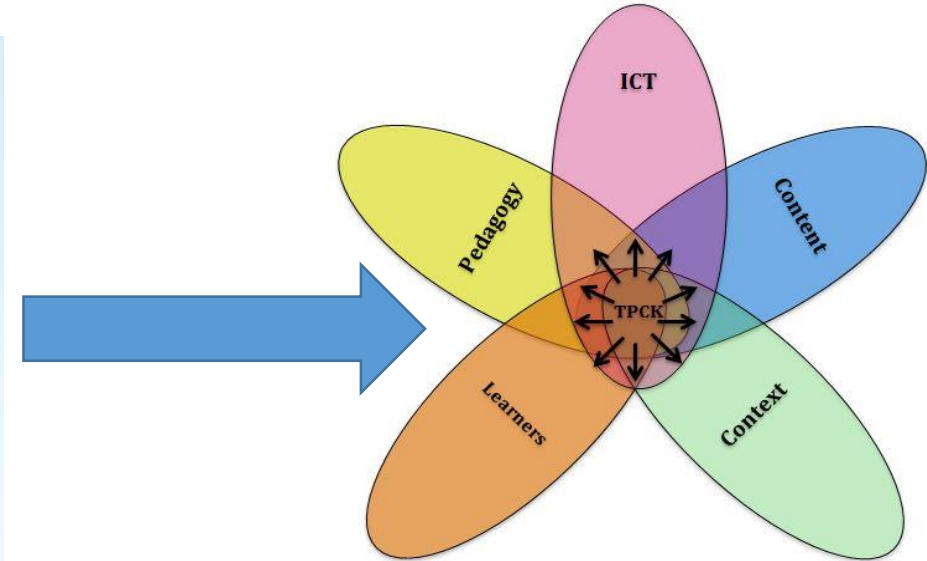
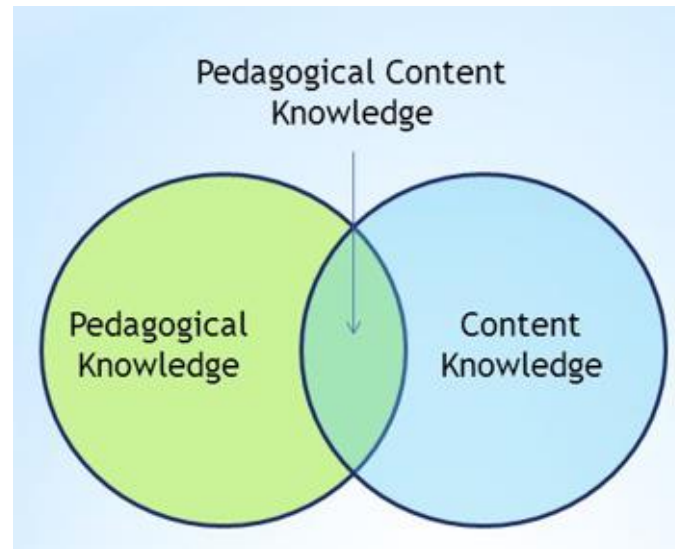
Pedagogical Content Knowledge:  
Teachers can transform the subject matter for instruction, and finding different ways to represent the material

\* **PCK Model**  
**(Shulman, 1986)**



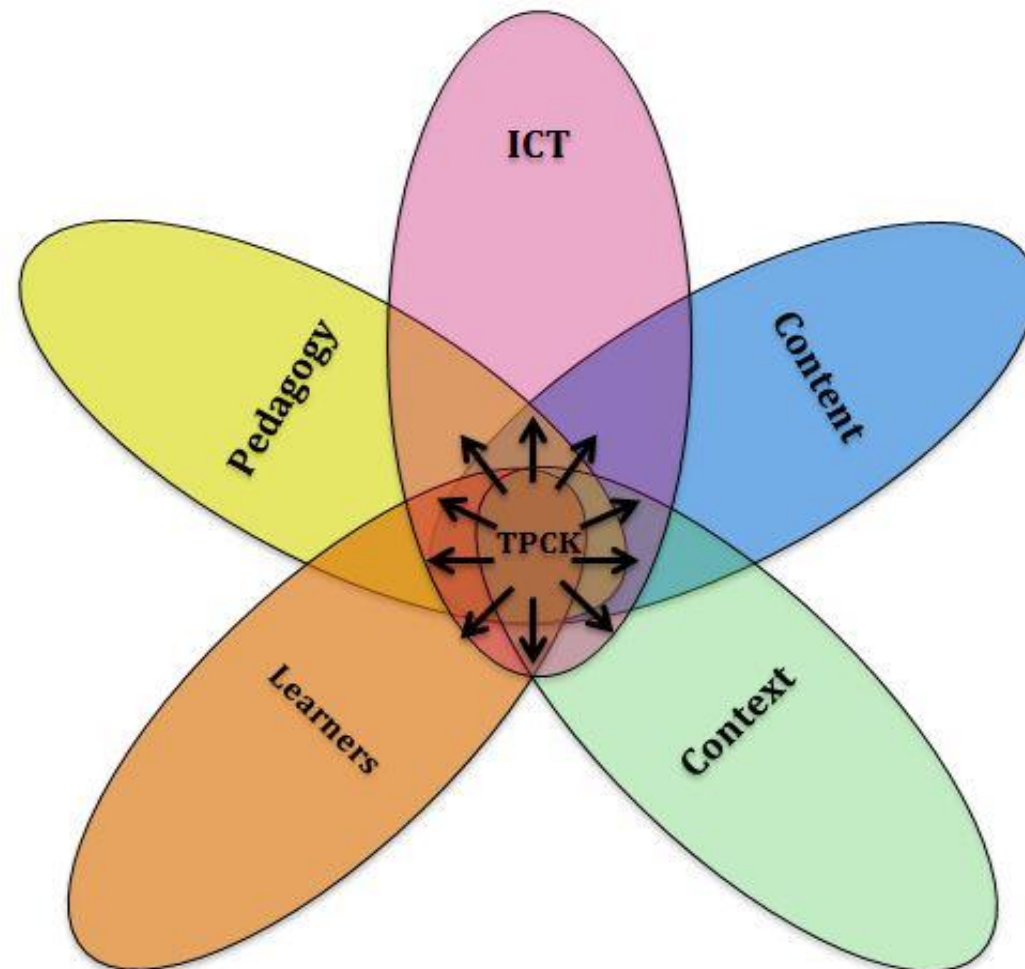
# Reconceptualization of teachers' body of knowledge

## From PCK to TPCK (20 years ago)



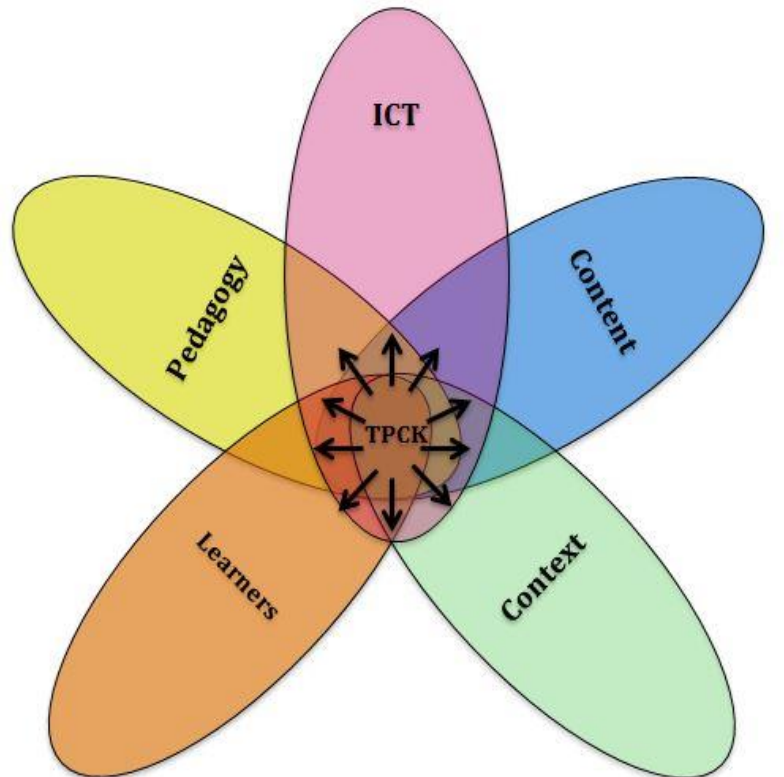


# Technological Pedagogical Content Knowledge (TPCK)





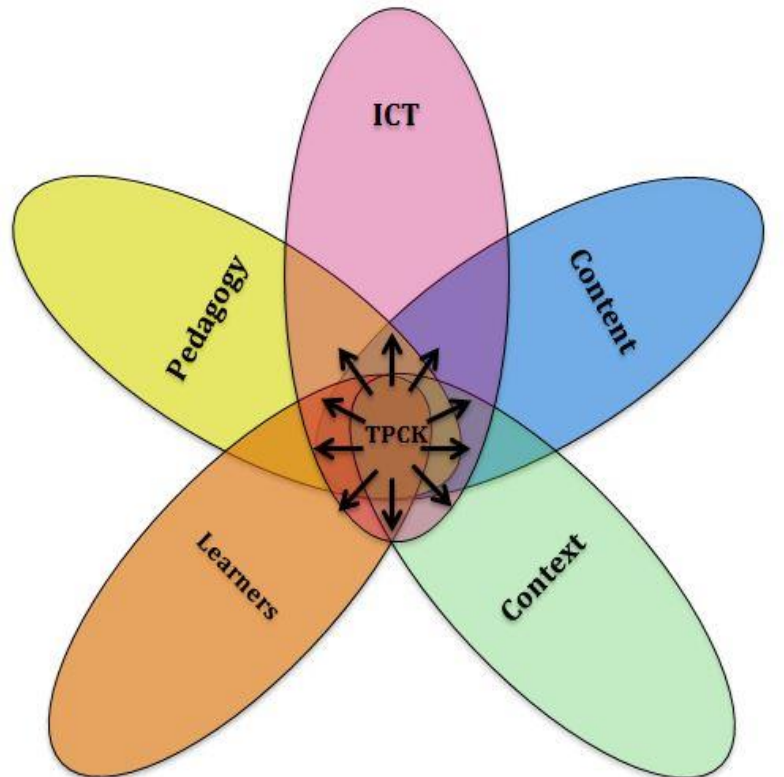
# TPCK



TPCK is teachers' knowledge about tools and their pedagogical affordances, pedagogy, content, learners, and context synthesized into an understanding of how particular topics that are difficult to be understood by learners, or difficult to be taught by teachers, can be transformed and taught more effectively with technology, in ways that signify the added value of technology (Angeli & Valanides, 2005, 2009, 2013, 2015).



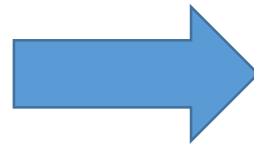
# TPCK



- TPCK is theorized as a transformative body of knowledge.
- Individual knowledge bases (C, P, T, L, Con) contribute to the development of TPCK, but increase of knowledge in one of them does not automatically increase TPCK.



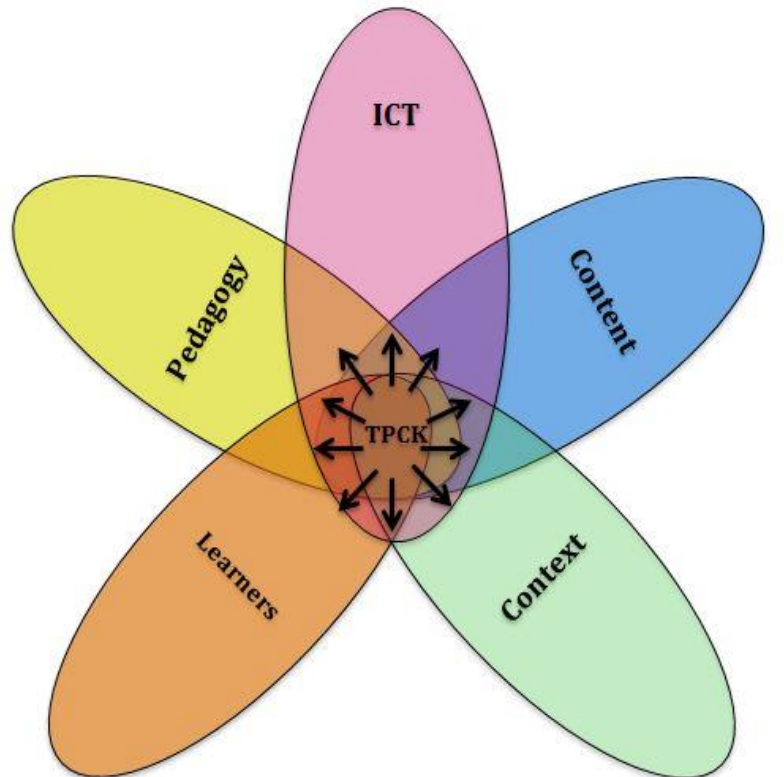
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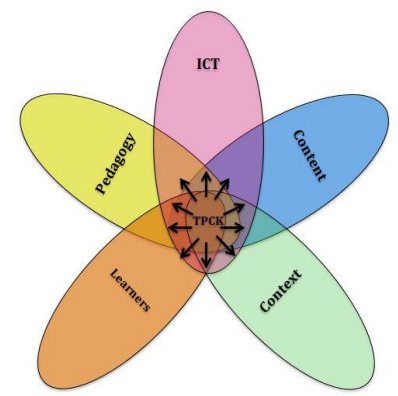




# TPCK

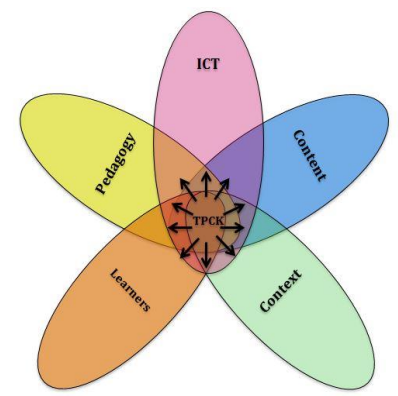


- TPCK is a unique body of knowledge that needs to be taught (Valanides & Angeli (2008a, 2008b).
- TPCK has been defined in terms of competencies.



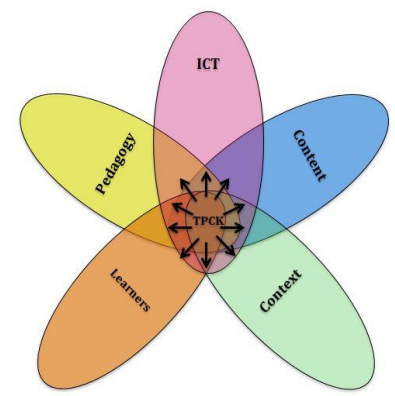
1. Identify topics to be taught with ICT in ways that signify the added value of ICT tools, such as topics that students cannot easily comprehend, or teachers face difficulties teaching or presenting them effectively in class.

- Abstract concepts (i.e., cells, molecules) that need to be visualized.
- Phenomena from the physical and social sciences that need to be animated (i.e., water cycle, immigration), complex systems (i.e., ecosystems, organizations) in which certain factors function systemically and need to be simulated or modeled.
- Topics that require multimodal transformations (i.e., textual, iconic, and auditory), such as, phonics and language learning.



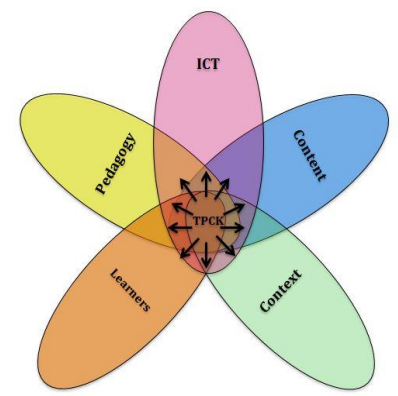
2. Identify appropriate representations for transforming the content to be taught into forms that are pedagogically powerful and difficult to be supported by traditional means.

- Interactive representations
- Dynamic transformation of data.
- Dynamic processing of data.
- Multiple simultaneous representations of data.
- Multimodal representations of data.



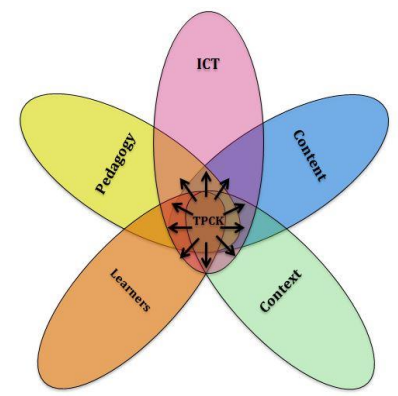
**3.** Identify teaching tactics, which are difficult, or even impossible, to be implemented by other means, such as the application of ideas in contexts that are not experienced in real life.

- Exploration and discovery in virtual worlds.
- Virtual visits (i.e., virtual museums).
- Testing of hypotheses and or application of ideas into contexts not possible to be experienced in real life.
- Complex decision-making.
- Long distance communication and collaboration with experts/peers.
- Personalized learning/ adaptive learning.
- Context-sensitive feedback.



## 4. Map tool affordances to pedagogical affordances

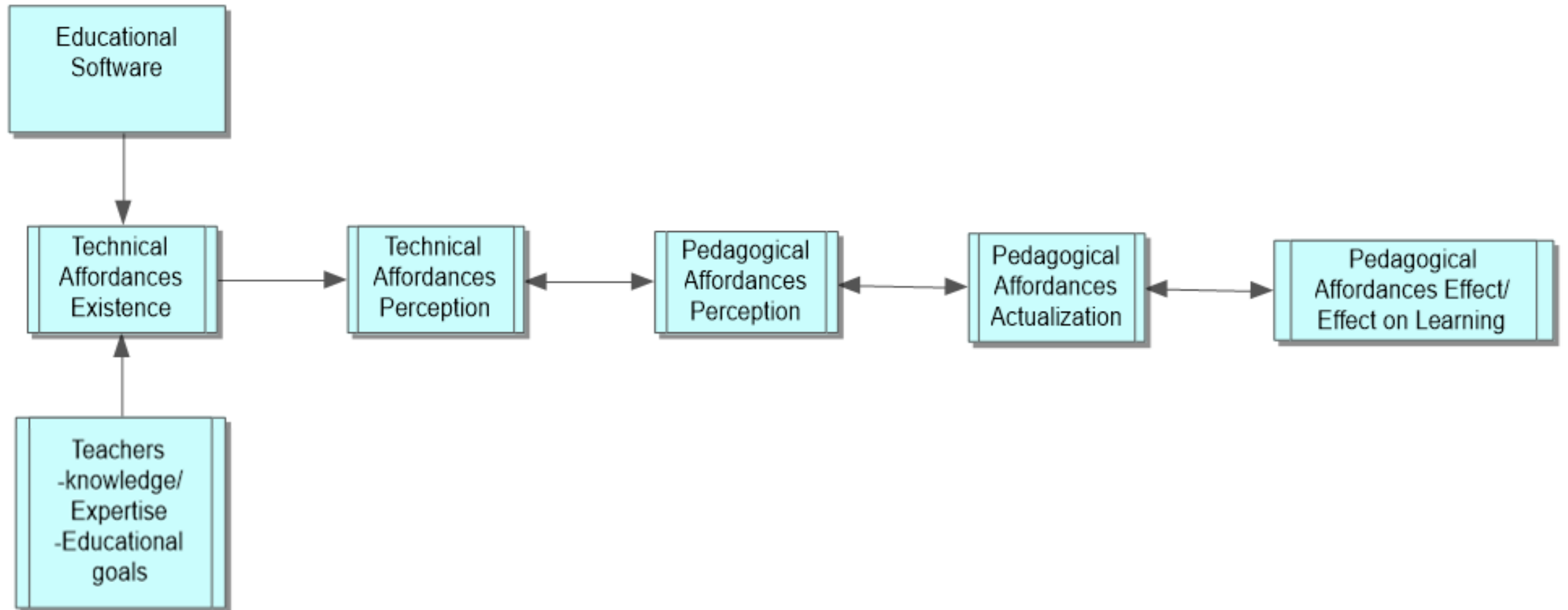
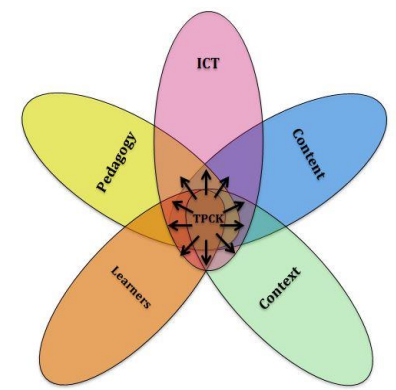
- A piece of software has technical features or technical affordances.
  - The technical affordances of Kidspiration include among others, Picture View, Writing View, Audio, and Hyperlink.
- Pedagogical affordance refers to how teachers perceive subjectively the functional value of software in pedagogical/learning design (Angeli & Valanides, 2013, 2018).
  - Hyperlinks can be used for discovery learning.

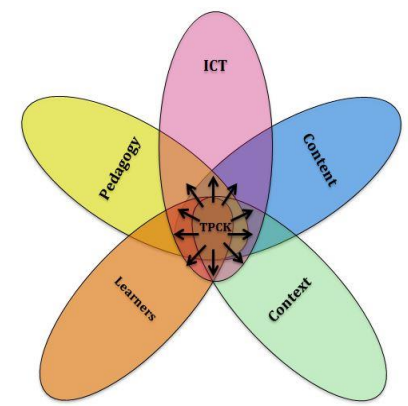


5. Integrate computer activities with appropriate learner-centered strategies in the classroom.

The learner is at the center of the learning process to

- express a point of view,
- observe,
- explore,
- inquire,
- problem solve.





Teachers interact with the technical features of tools and come to recognize and familiarize themselves with the technical affordances of tools.

Teachers come to realize/perceive the technical affordances as enablers of pedagogical action. This is an iterative and emergent process that involves transformation of the technical affordances into pedagogical affordances.

Teachers recognize the potential of pedagogical affordances for performing an action.

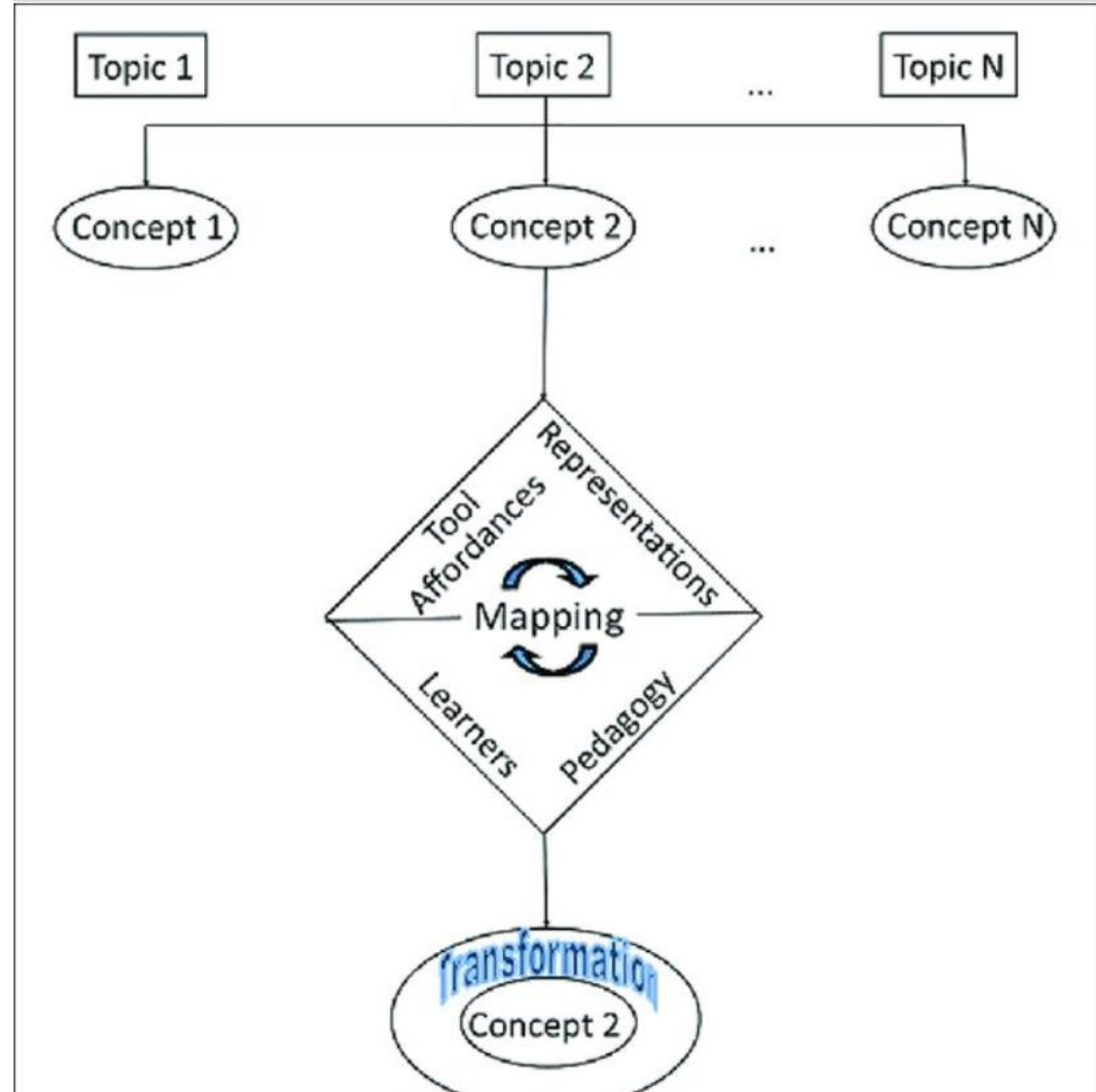
Teachers use the pedagogical affordances of tools into actual classroom practices/lessons.

Affordance actualization results in (a) reconceptualization of pedagogical affordances and (b) learning effects.





# Technology Mapping



# Tools

Padlet  
AI slides  
Coggle  
EducaPlay  
Quizlet  
Mindmeister  
Kahoot  
Plickers  
EdModo  
Google Classroom  
Animation Desk  
Scratch  
Flip

## Padlet

Features of the technology	Affordances (activities and practice)	Affordances (examples of pedagogy and designs)
Participants do not need to login to access.	Easy access for all participants.	<p><b>COLLABORATION:</b></p> <ol style="list-style-type: none"> <li>On content knowledge – students are asked to post a KWL (<i>What do I know, What do I want to know, How will I find out ? What have I learnt? </i>) at the beginning or a unit of study. Students return to this during the unit to add answers to their questions, new questions and new learnings.</li> <li>Students brainstorm/share ideas related to a topic and are able to build on each other's ideas as they are posted.</li> </ol>
All participants' activity is instantly viewable.	Supports real time collaboration by multiple users. Also support asynchronous collaboration.	
Easy to embed images and video from online sources.	Allows users to draw together resources from the web into a single space.	
Drag and drop function to add images or upload files from computer.	Makes uploading files and images from a computer or hard drive very simple.	
Autosave function.	Contributors do not need to save work. Ideas are not lost. Adds to ease of use for participants.	
Choice of free form layout or stream layout.	Freeform layout allows users to place posts close to related ideas. Stream layout automatically organises posts in chronological order by placing each post in chronological order. Each suited to different types of activity. May assist teachers and students to reflect on the direction a particular discussion or brainstorming session is taking.	<p><b>HIGHER ORDER THINKING ( understanding complex &amp; ill-defined problems)</b></p> <ul style="list-style-type: none"> <li>Students organise posts/ ideas according to patterns or categories that are negotiated between the contributors.</li> </ul>
Can be embedded in a blog or EdStudio	Allows collaborators to view padlet as a work in progress from a common space or finished product. Allows the groups work to be displayed in a common space. May also assist collaborators to construct discussions or group blogs related to the padlet content.	<p><b>SUBSTANTIVE CONVERSATION</b></p> <ul style="list-style-type: none"> <li>Contents of a communally created padlet are be used as a basis for discussions to ensure all points of view are considered.</li> </ul>
Privacy settings allow the wall owner to choose who can view, write and moderate a particular wall.	Walls can be created where students can add/ delete and edit their own contributions but cannot alter the contributions of anyone else.	<p><b>CONNECTEDNESS</b></p> <ul style="list-style-type: none"> <li>Students may create a publish wall that can viewed by members of the wider community, parents or experts.</li> </ul>
Contributors move posts without affecting the other content on the wall.	Users can easily move / reorganise posts to restructure ideas. Assists with collecting ideas then creating categories to organise this information.	<p><b>MULTIPLE MEANS OF EXPRESSION</b></p> <ul style="list-style-type: none"> <li>Students are asked to investigate a particular topic, feature or technique. They can link to video/ image examples instead of explaining verbally.</li> </ul>
The wall owner can choose to be notified once per day of all activity posted on the wall.	Allows teachers to monitor contributions and general participation in the activity.	<ul style="list-style-type: none"> <li></li> </ul>
Anonymous posting.	Teachers need to teach students expected protocol of adding their name to the beginning of any post.	<p><b>REFLECTION</b></p> <ul style="list-style-type: none"> <li>Use the stream function to view the progression</li> </ul>



# COVID-19, TPCK, and Uncertainty

- Studies report a decrease in teachers' self-reported TPCK (Mourlam et al., 2023).
- Teachers struggled to enact their TPCK in a new instructional context in less-than-ideal circumstances (Daher, 2022).
- **Teachers' decreased TPCK scores is likely an indicator of their recalibration of their knowledge as they experienced *a new and ill-defined instructional context*.**
- So, why TPCK competencies do not transfer to new contexts?



# COVID-19, TPCK, and Uncertainty

- Do we need more sophisticated TPCK competencies to adapt to new teaching contexts?
- Do teachers recognize the affordances of new teaching contexts and automatically develop effective TPCK practices?



# Factors Contributing to Teachers' Uncertainty

1. Teaching was taking place outside the regular classroom environment in other environments they could not control.
2. Interactions between the teachers and students suddenly changed.
3. There was not a blueprint to guide them in this effort.
4. Existing TPCK knowledge looked different as they struggled to enact it in a context they did not know much about.

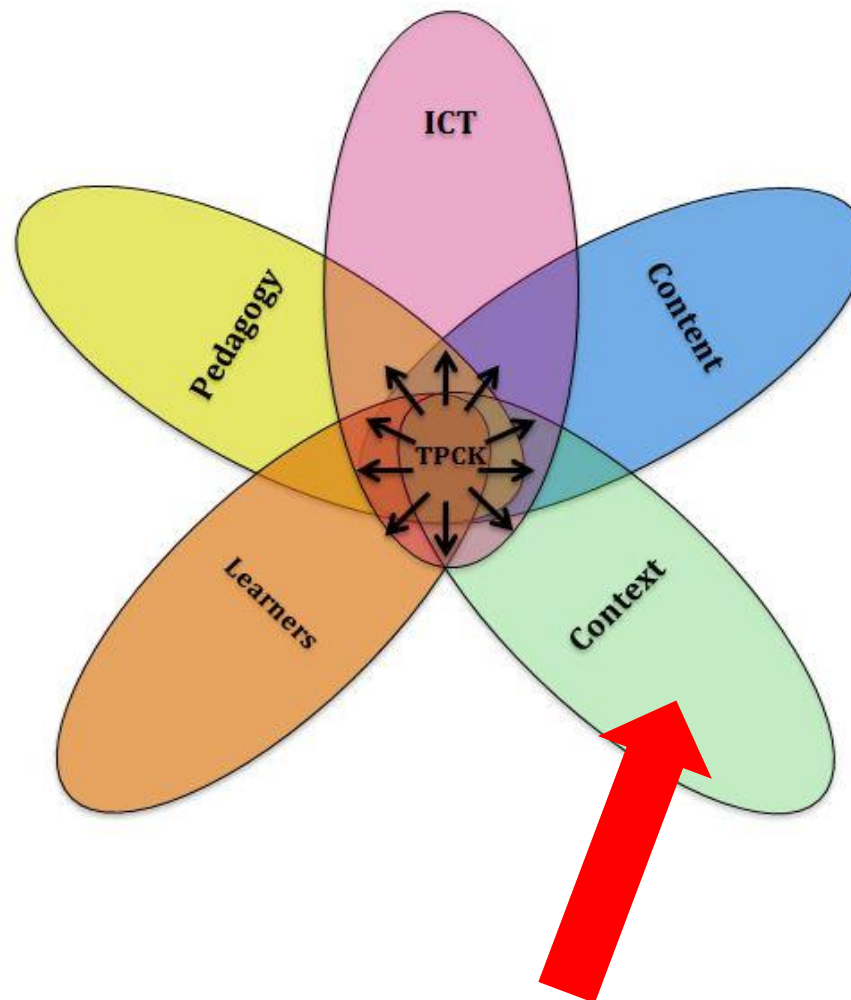


# COVID-19, TPCK, and Uncertainty

- As instructional contexts change it is possible that teachers may not have the requisite knowledge and skills needed to teach effectively in the new setting (Phillips & Harris, 2018).
- Although context has been conceptualized as occurring in multiple different levels of TPCK development (Porrás-Hernández & Salinas-Amescua, 2013; Rosenberg & Koehler, 2015), it seems that additional research is needed to develop a more comprehensive understanding of contextual factors influencing teacher's decision-making.



# COVID-19, TPCK, and Uncertainty



Knowledge of context ranges from the workings of the classroom, to the educational values and goals, as well as teachers' philosophical underpinnings in conjunction with their epistemic beliefs about teaching and learning.





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# Defining Contextual Knowledge

**A systemic multilevel framework for  
studying contextual factors affecting  
TPCK**



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# Defining Contextual Knowledge

- Attending to context can strengthen our understanding of teaching with technology across contexts.
- Taking context seriously enables us to understand the conditions under which teaching with technology is most effective.
- As researchers better understand these contextual conditions, they can contribute their expertise to teachers, parents, administrators, and other stakeholders to change practice.



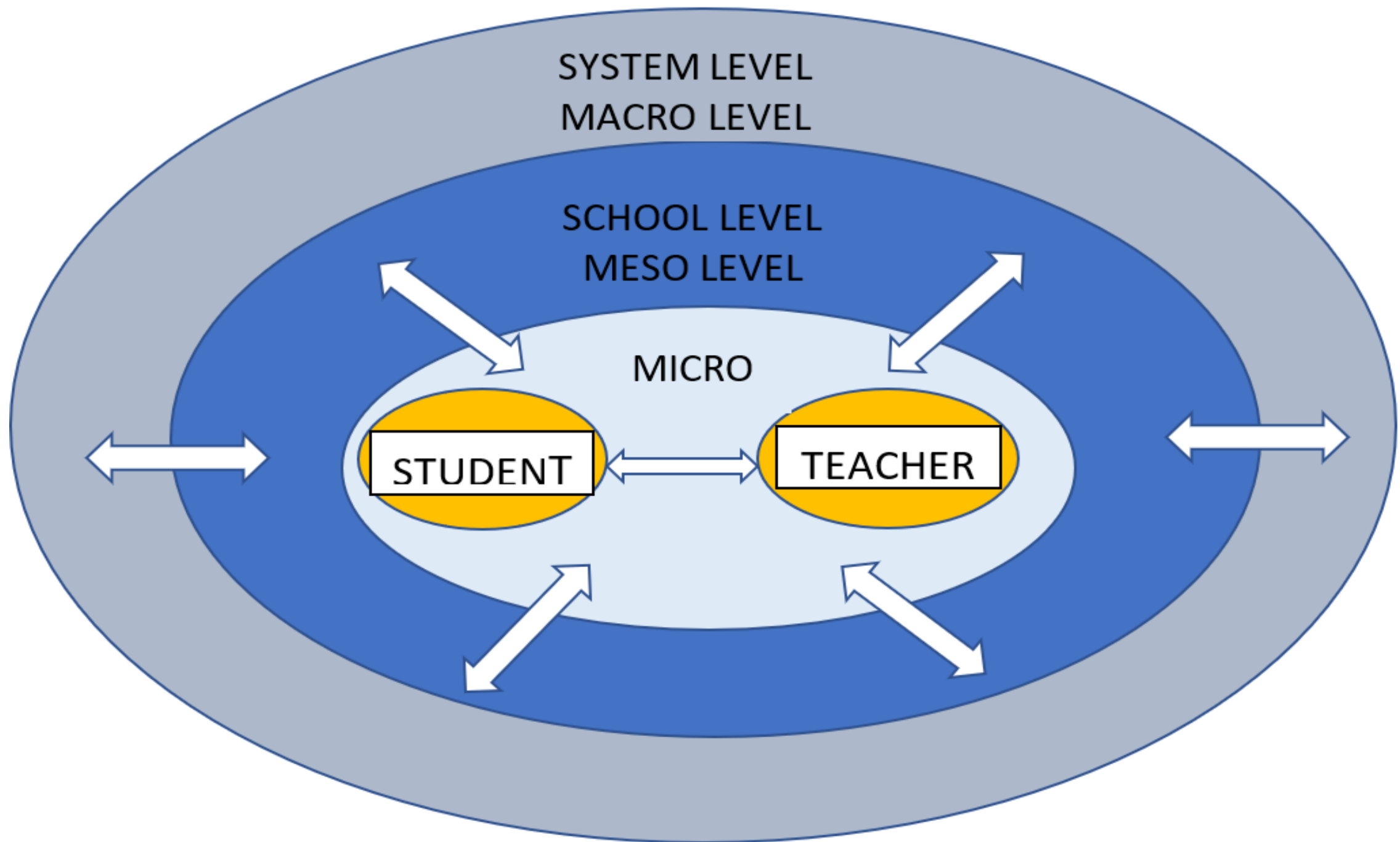
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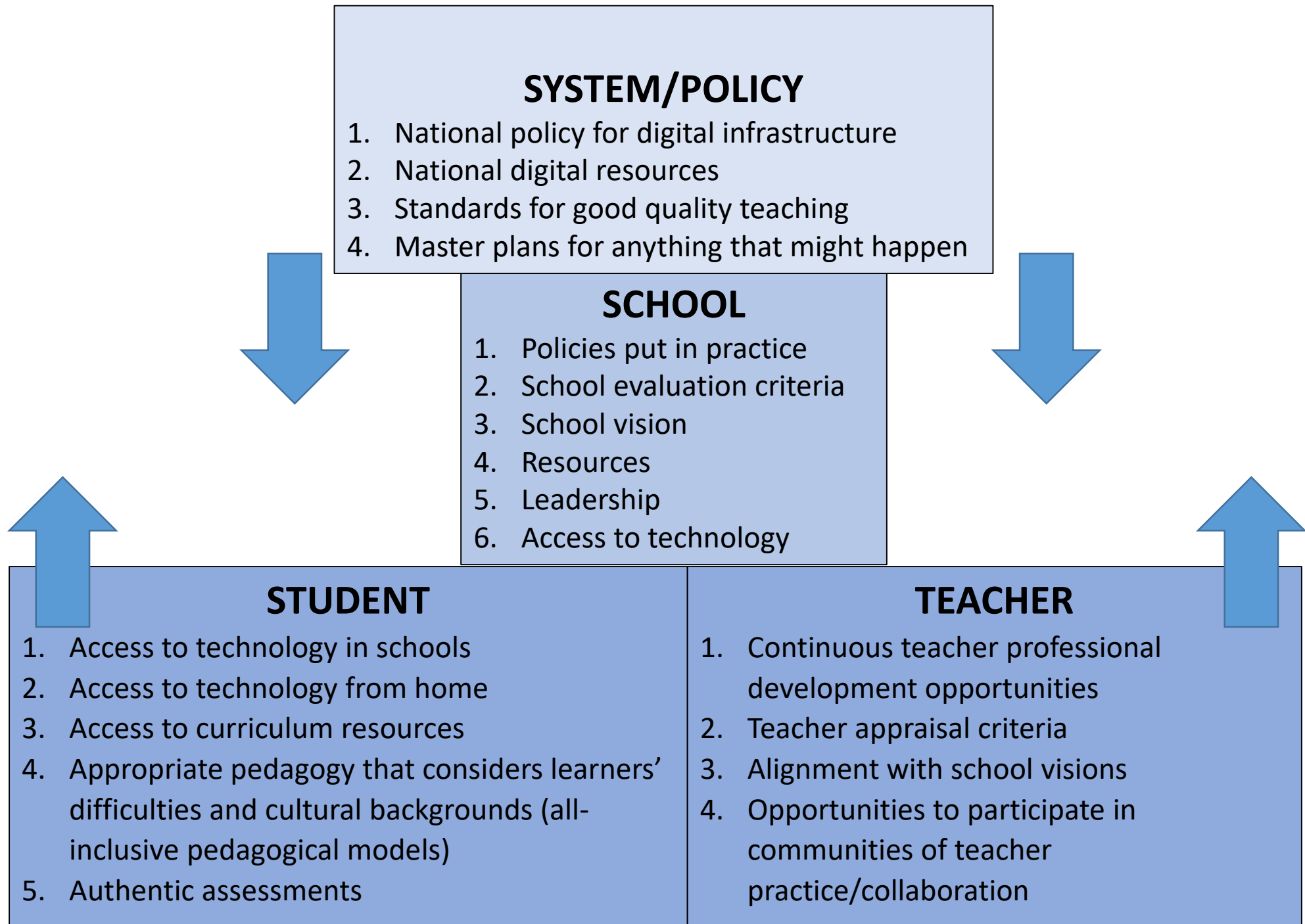
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# Defining contextual knowledge

- The proposed factors address conditions at the student, teacher, school and system levels, and are organized in a systemic framework to help foreground interactions and interdependencies within and across the different levels.
- It is theorized that within this new context, interactions will increase/improve if teachers find a way to include all learners using culturally responsive teaching and assessment practices.







## Future research on TPACK

### Flexible TPACK frameworks

- Implications for future preparedness, emphasizing the need for **flexible TPACK frameworks that account for contextual variability** and promote equitable practices.
- As we navigate the evolving educational landscape, a nuanced appreciation of these contextual factors becomes essential for the **holistic evolution of the TPACK framework in diverse global settings, fostering resilient and adaptable education systems.**

Thank you.

QUESTIONS



Contact Charoula Angeli at  
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